Debate Dialog for News Question Answering System 'NetTv' ~Debate Based on Claim and Reason Estimation~

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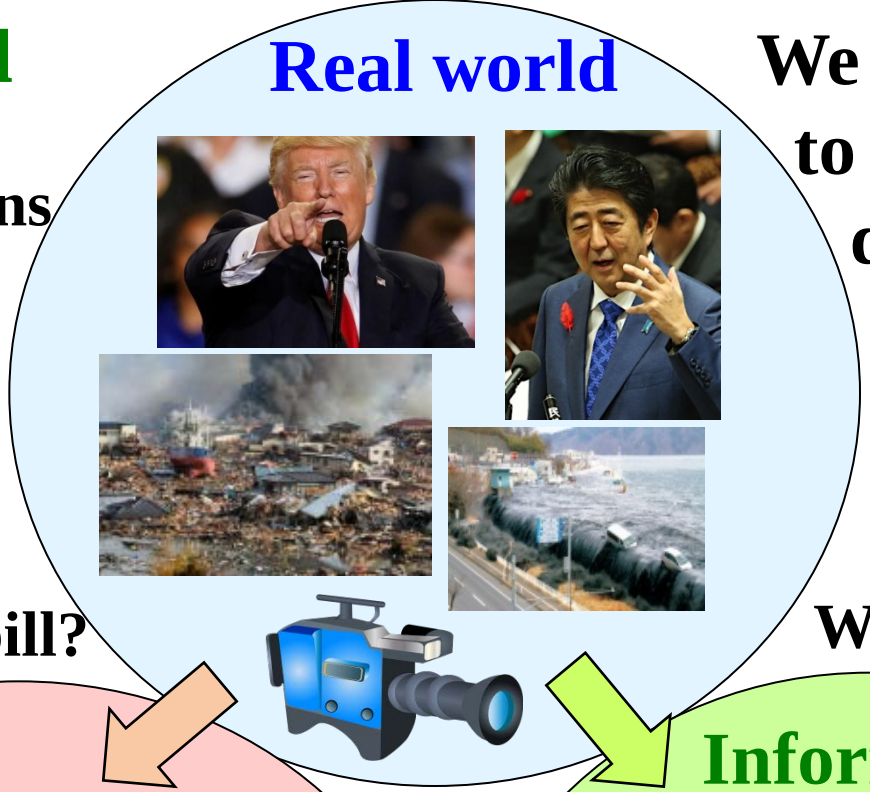
Background

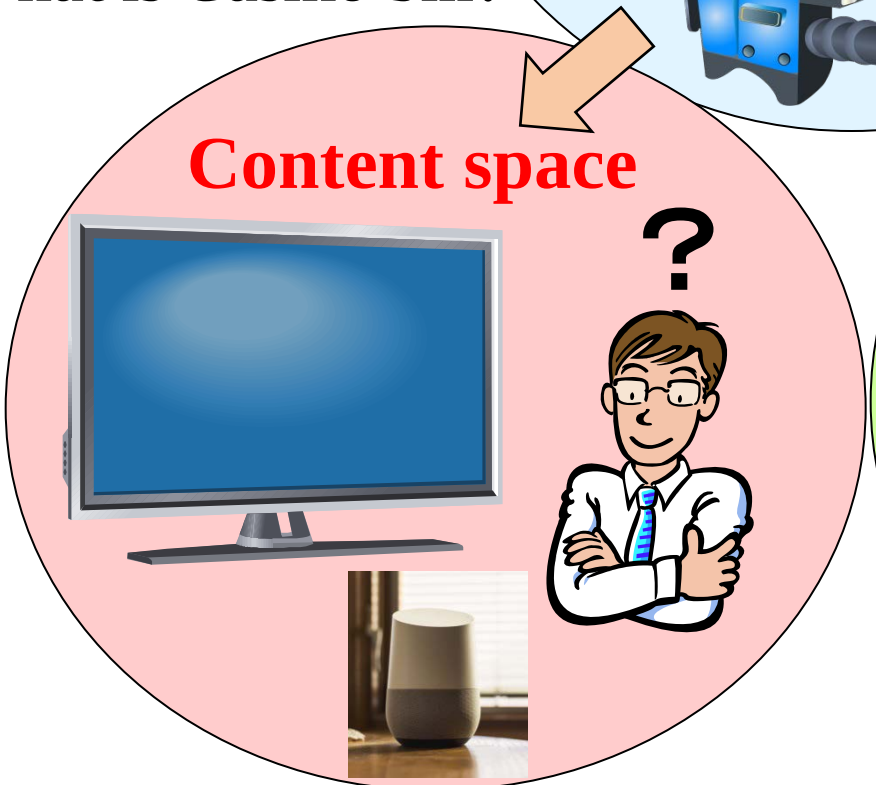
We have questions in everyday life.

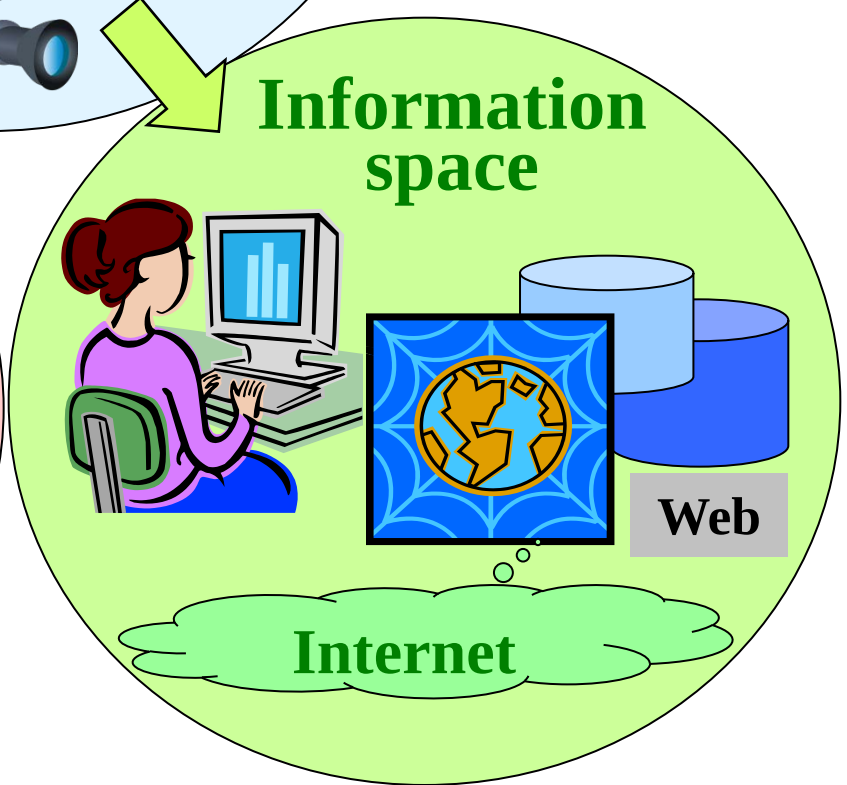
We need an assistant to understand them deeper and wider.



What is Casino bill?

What causes Tsunami?





Research purpose

Show me news on xx.
What is Casino bill?

For deeper and wider understanding.

Content space

About xxx…

Net TV

Speech recognition

Dictionary update
Grammar

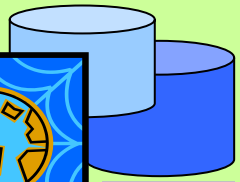
QA module

Q classification
•Factoid Q
•Definition Q
•Why Q
•How Q

Answer retrieval

Debate module

Information space



We b

Internet

NetNews module

News indexing
•Web spider
•Html parser
•Morphological analysis

Net news database

- Newspage_URL
- Movie_URL
- Time, Headline

Debate system

[1] Classifying Stance and Reasons, Predicting Winners

Classifying Positions: Support or Oppose?

Akiko.Murakami, Rudy.Raymond, " Support or Oppose? Classifying Positions in Online Debates from Reply Activities and Opinion Expressions," in Proceedings of the 23rd ICCL, pp.869-875, 2010.

Identifying and Classifying Reasons

Kazi Saidul Hasan and Vincent Ng , "Why are You Taking this Stance? Identifying and Classifying Reasons in Ideological Debates," Proceedings of the EMNLP, pages 751–762, October 25-29, 2014.

Predicting Debate Winners

Peter Potash and Anna Rumshisky, "Towards Debate Automation: a Recurrent Model for Predicting Debate Winners," Proceedings of the EMNLP, pages 2465–2475 Copenhagen, Denmark, September 7–11, 2017.

[2] Argument Visualization and Generation

Argument Generation System

Users can specify a topic and a stance (agree/disagree).
The system outputs three argument paragraphs based on "values".
Each value is regarded as a viewpoint of the generated argument.

OpinionReader: Argument Visualization

System summarizes and visualizes the arguments for a target topic in two-dimension of polarity and importance.

Argument Generation System

Users can specify a topic and a stance (agree/disagree).
The system outputs three argument paragraphs based on "values".
The "value" represents what is important in human's life, what is harmful in communities. The value dictionary formulates a set of values.
Each value is regarded as a viewpoint of the generated argument.

Misa Sato, Kohsuke Yanai, Toshihiko Yanase, Toshinori Miyoshi, Makoto Iwayama, Qinghua Sun, Yoshiki Niwa,
"End-to-end Argument Generation System in Debating," Proceedings of ACL-IJCNLP 2015 System Demonstrations, pages 109–114, Beijing, China, July 26-31, 2015.

Stance (agree)

Values & #sentences

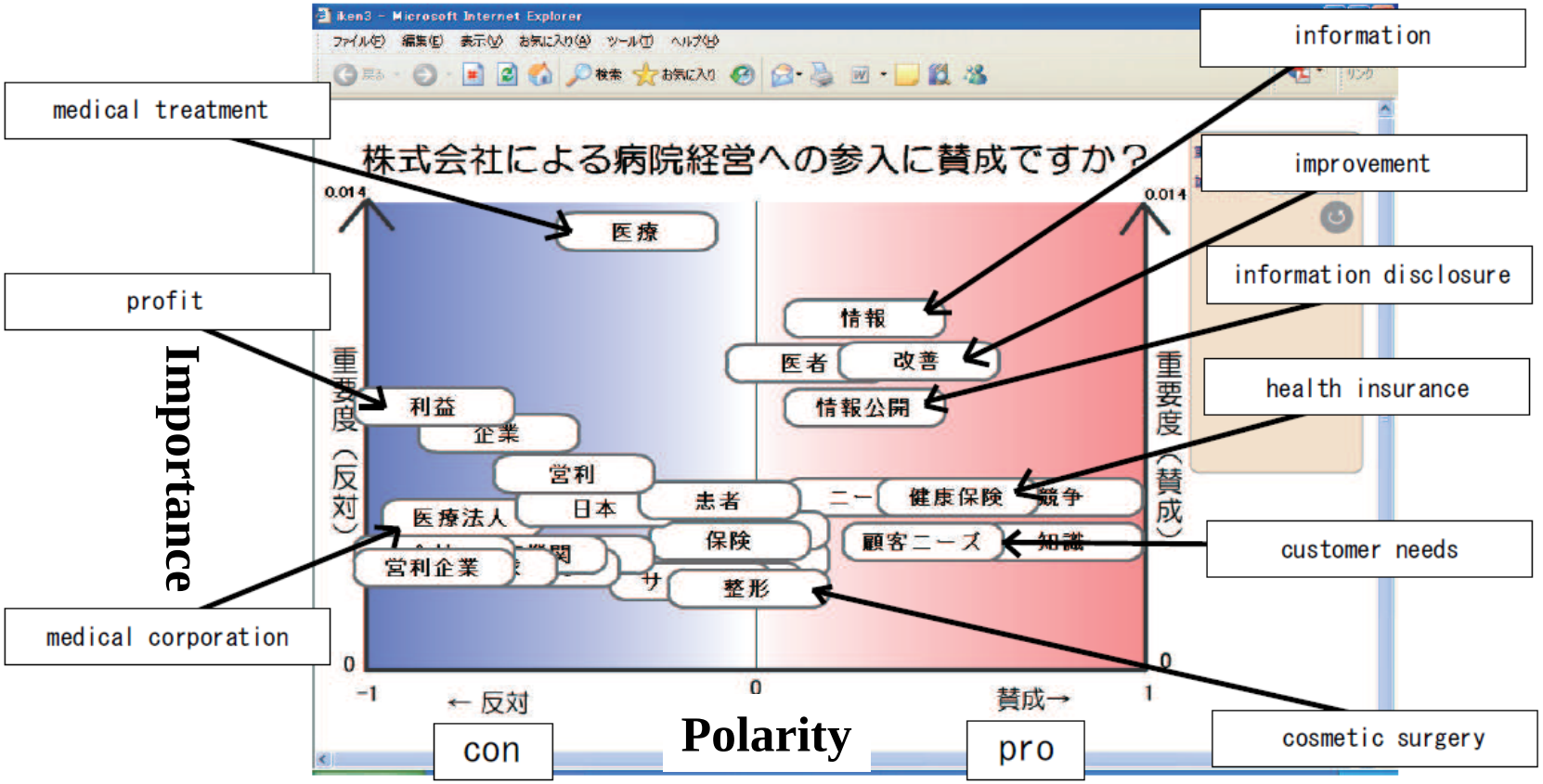
Three argument paragraphs

OpinionReader : Argument Visualization

System summarizes and visualizes the arguments for a target topic in two-dimension of polarity and importance.
Users can catch the arguments, choosing a more reasonable viewpoint for decision making.

A. Fujii and T. Ishikawa, "A system for summarizing and visualizing arguments in subjective documents: Toward supporting decision making," Proc. COLING-ACL Workshop on Sentiment and Subjectivity in Text, pp.15–22, 2006.

Topic: Privatization of hospitals by joint-stock companies?



Debate components

Topics This house should ban smoking in public spaces.

Viewpoints (values) [stance(polarity)/importance]
Poverty, pollution, disease, health, cost

Evidences(fact,logic) [pos/neg ⇨ values up/down] ➡ *Reasons*
Smoking causes cancers ⇨ values down

Arguments [topic, stance, reasons] ➡ *Debate*

Decision making [stance-decision, for the topic, based on reasons]

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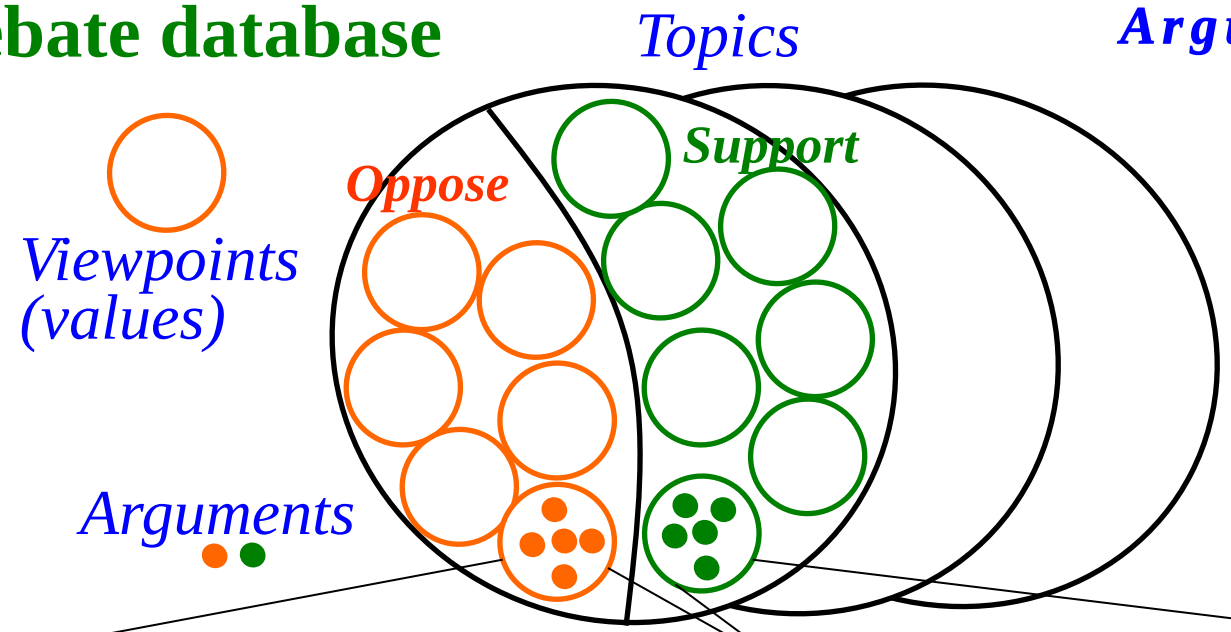
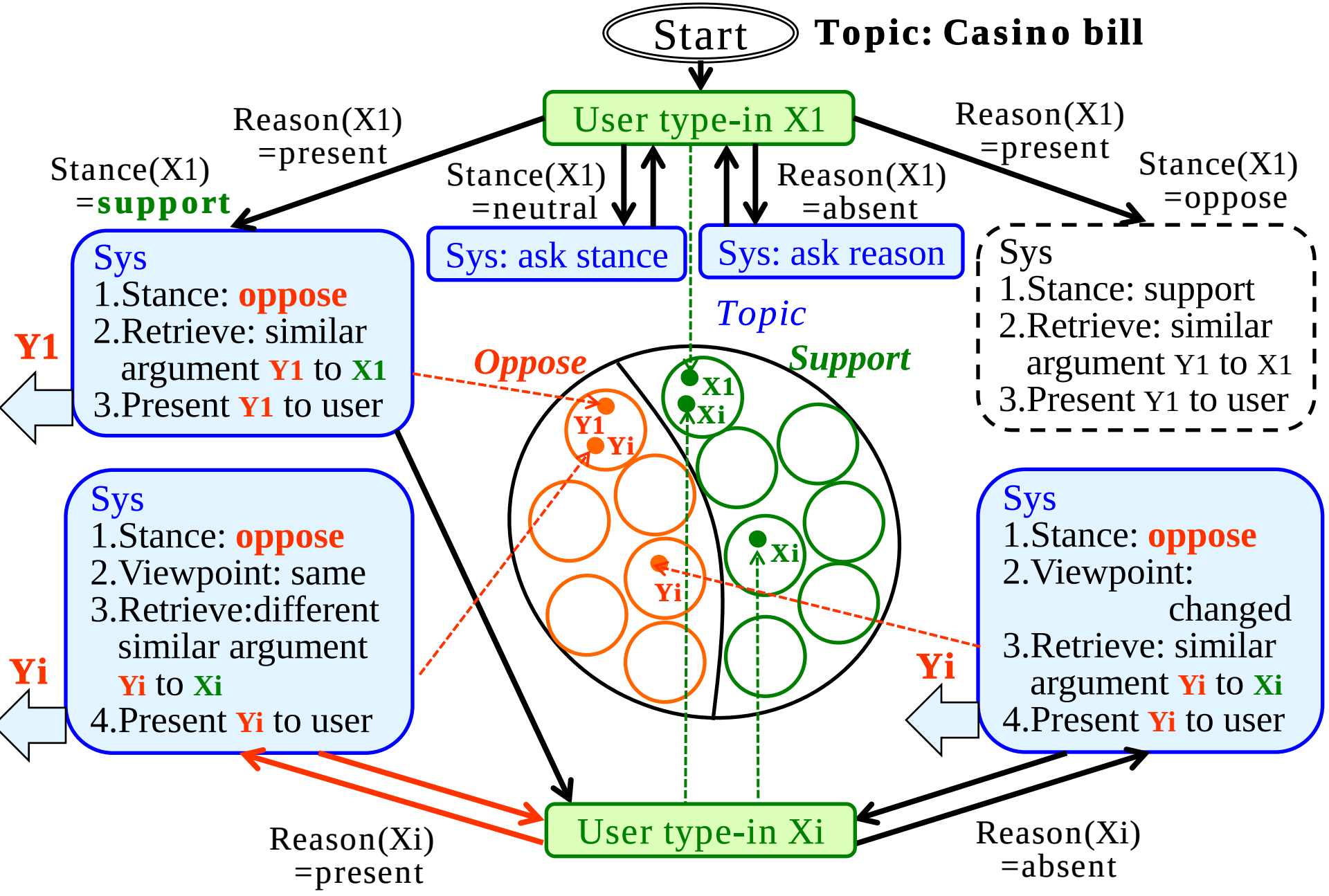
Debate database



ID	Text	Class	Vector
0	Disagree ・・・	2	[0,1,1,・・・,0,1]
1		2	

ID	Text	Class	Vector
0	Disagree ・・・	5	[0,0,0・・・,1,1]
1		5	

Debate State Diagram



Stance & Reason estimation

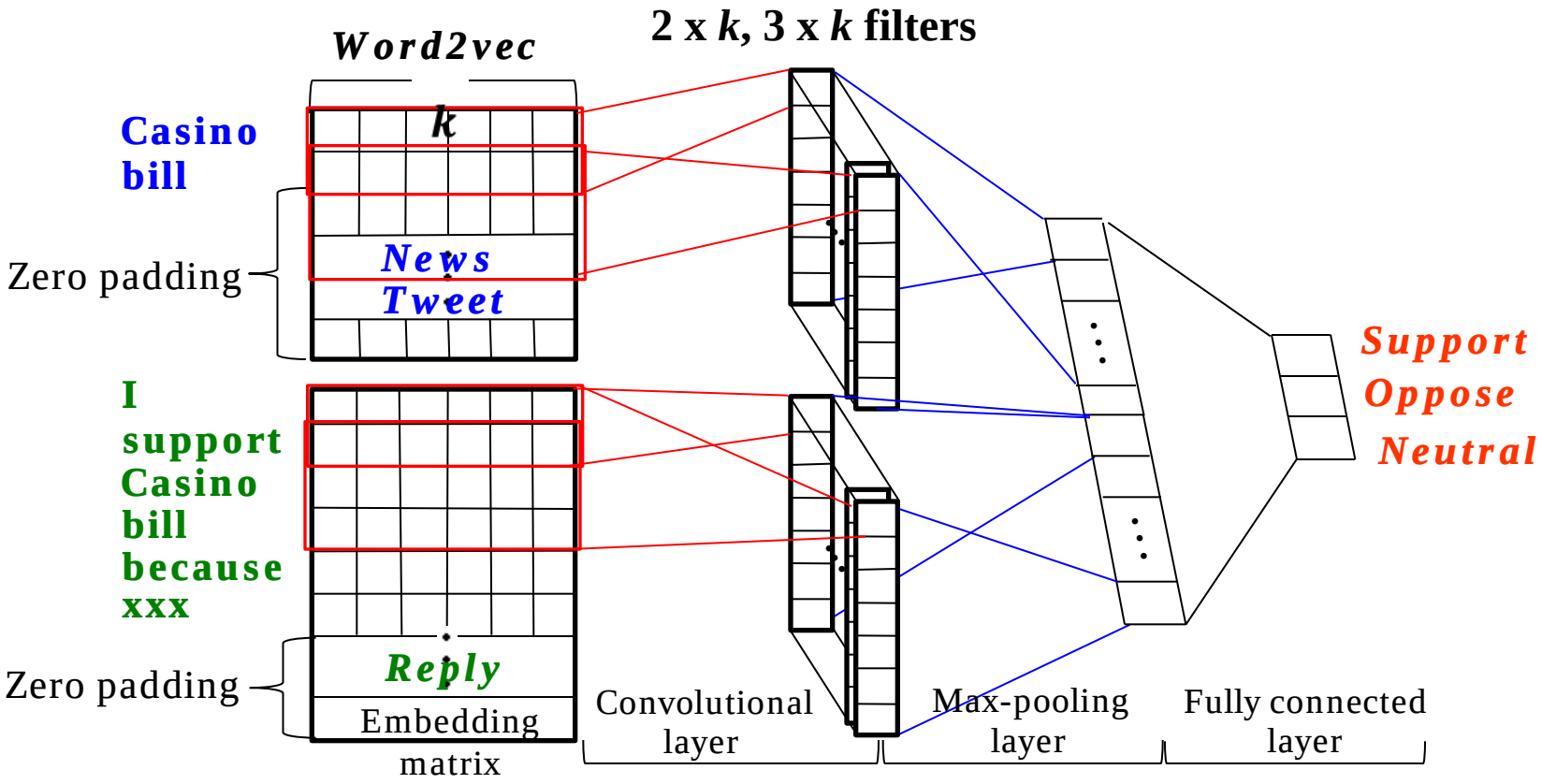
Training data: news Tweets and the paired user Replies.

Input: word2vec word embedding learned with Wikipedia.

Output: Stance support/oppose/neutral Reason present/absent

CNN model:

Hongjie Shi, Takashi Ushio, Mitsuru Endo, katsuyoshi Yamagami and Noriaki Horii, "A Multichannel Convolutional Neural Network For Cross-language Dialog State Tracking ," *IEEE Workshop on Spoken Language Technology*, 2016.



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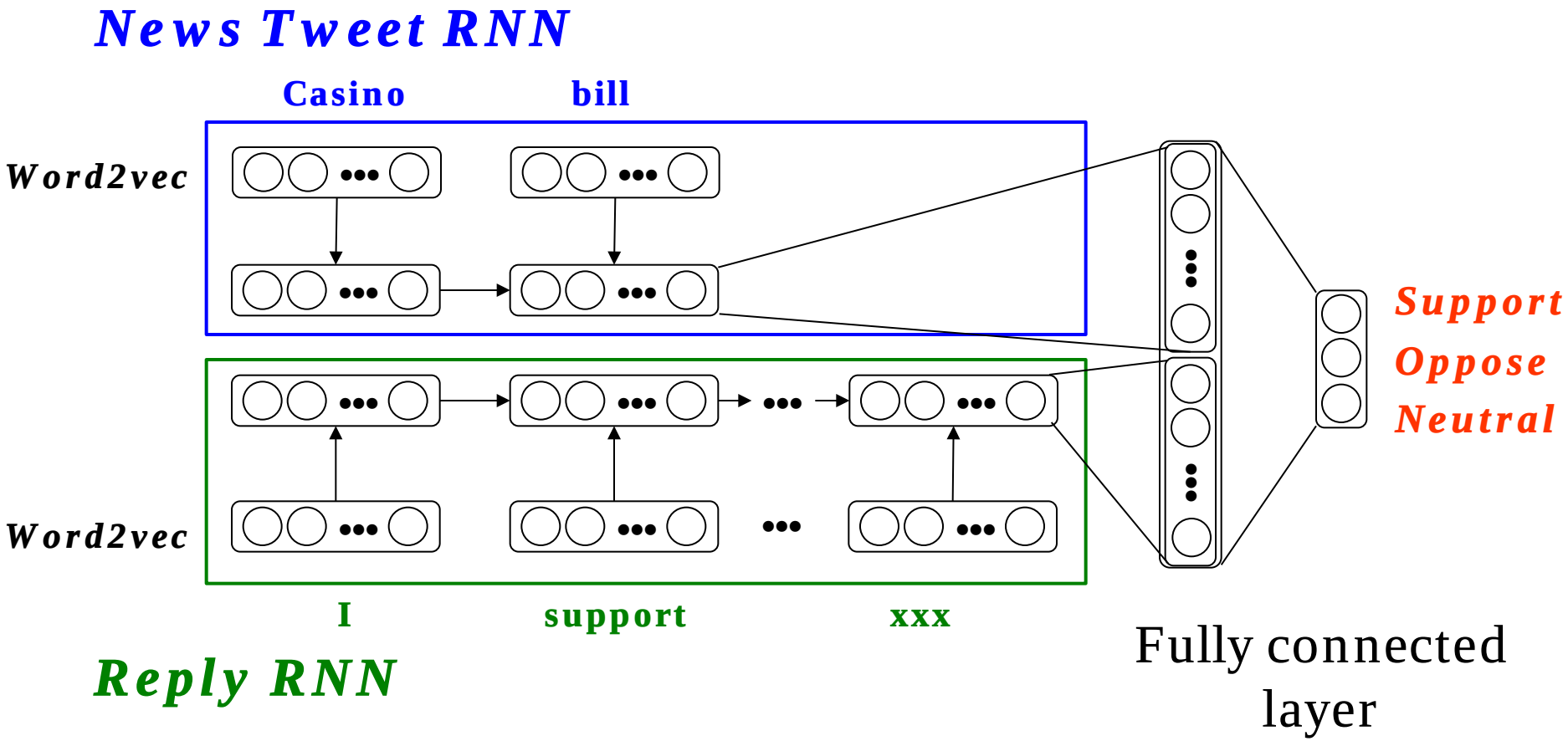
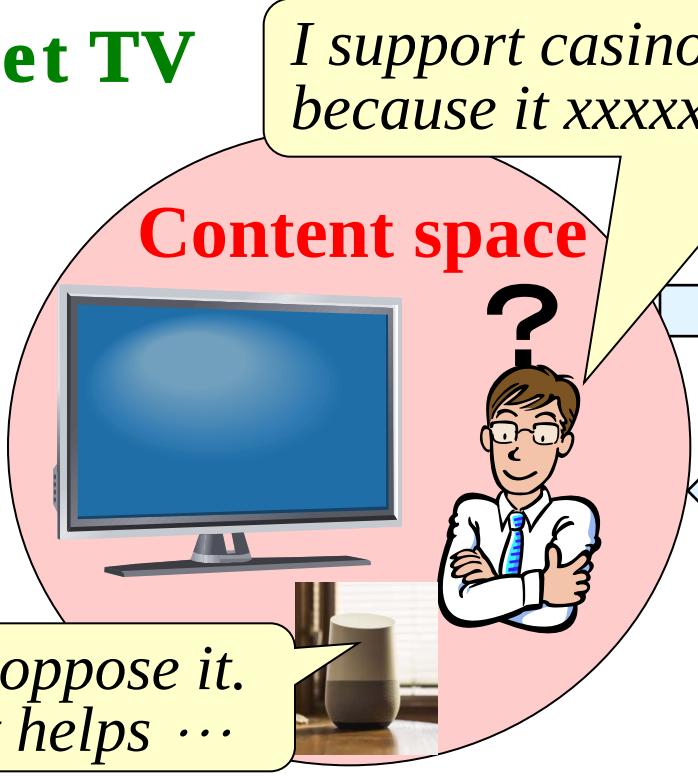
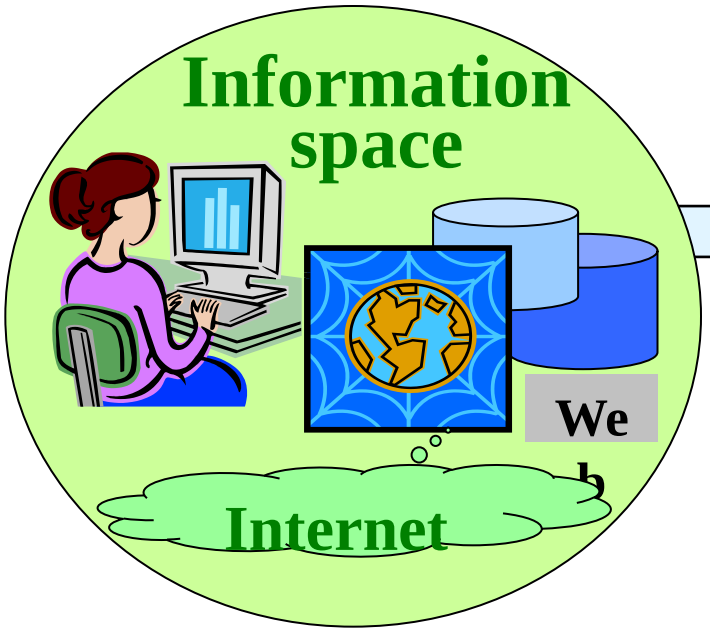
RNN model:



Net TV

Debate system for deeper and wider understanding





Text input

Text output

Language understanding

Debate management

ID	Text	Class	Vector
0	Disagree …	2	[0,1,1,…,0,1]
1		2	

ID	Text	Class	Vector
0	Disagree …	5	[0,0,0…,1,1]
1		5	

Word extraction
- *Morphological analysis*

Stance estimation
- *Support*
- *Oppose*
- *Neutral*

Reason estimation
- *Present*
- *Absent*

Argument retrieval
- *Opposite stance*
- *Similar viewpoint*

Argument & view
- *Initial search*
- *Re-search*
- *Filtering*
- *LDA*

Experiment

Experimental data:

News Tweets(topic) of the Sankei newspaper official account (@Sankei_news) and the paired user Replies acquired by Twitter API.

Stance estimation (support/oppose/neutral)

Training data: 1486 sentences (support: 458, oppose: 831, neutral: 831)

Test data : 150 sentences (support: 50, oppose: 50, neutral: 50)

Reason estimation (Present/Absent)

Training data : 1301 sentences (present: 218, absent: 1083)

Test data : 100 sentences (present: 50, absent: 50)

Experimental condition:

RNN hyper parameters

	Stance	Reason
Dropout rate	0.5	0.4
# of hidden nodes	-	64
Learning rate	0.0001	0.001

CNN hyper parameters

	Stance	Reason
Dropout rate	0.5	0.4
# of filters (1 x k)	-	64
# of filters (2 x k)	64	64
# of filters (3 x k)	64	-
Learning rate	0.0001	0.001
Weight decay	0.0001	0.0001

Experiment

Experimental result:

Accuracy(%)

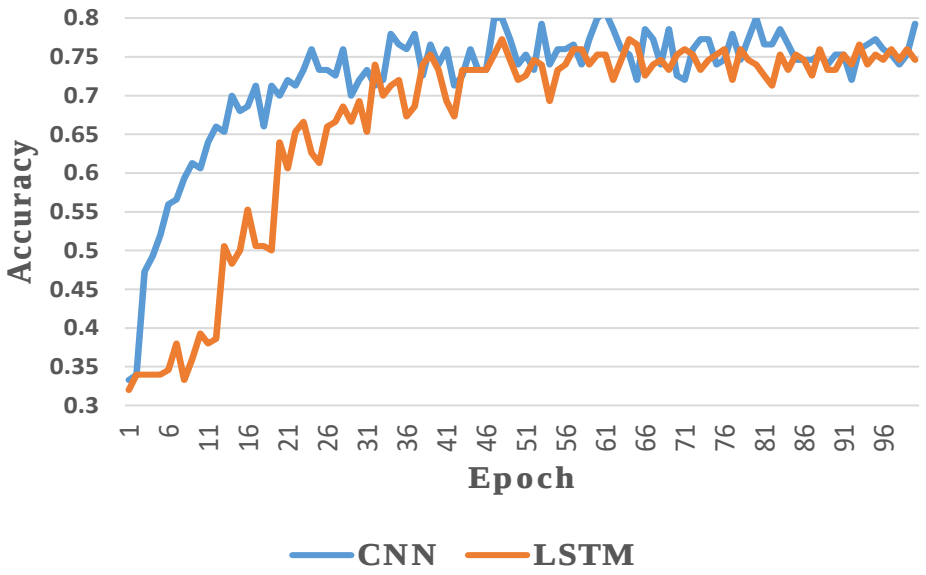
	Stance	Reason
CNN	80.0	80.0
RNN	78.0	80.0

Training time for 1 epoch(sec)

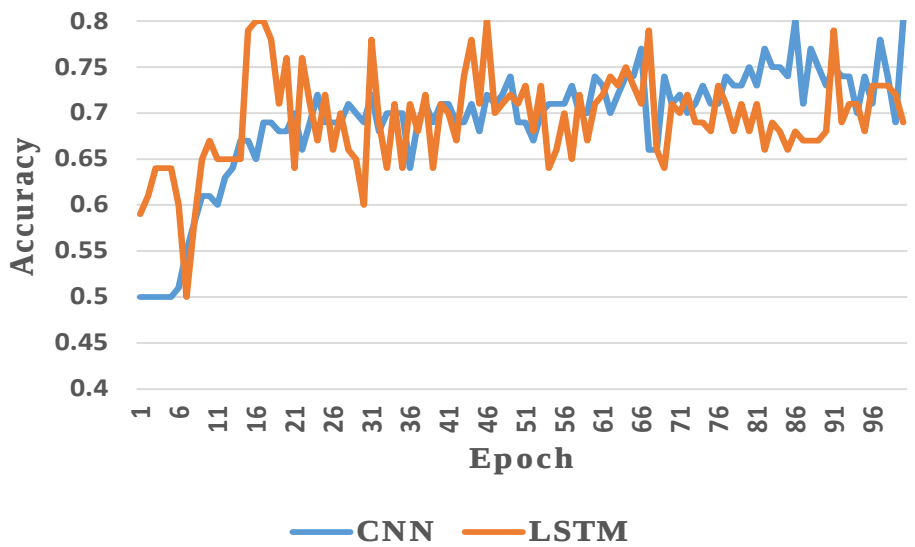
	Stance	Reason
CNN	7.41	6.808
RNN	30.32	30.02

Accuracy as a function of epoch

Stance



Reason



Experiment *Subjective evaluation*

Experimental condition: *Number of arguments Collected in debate database*

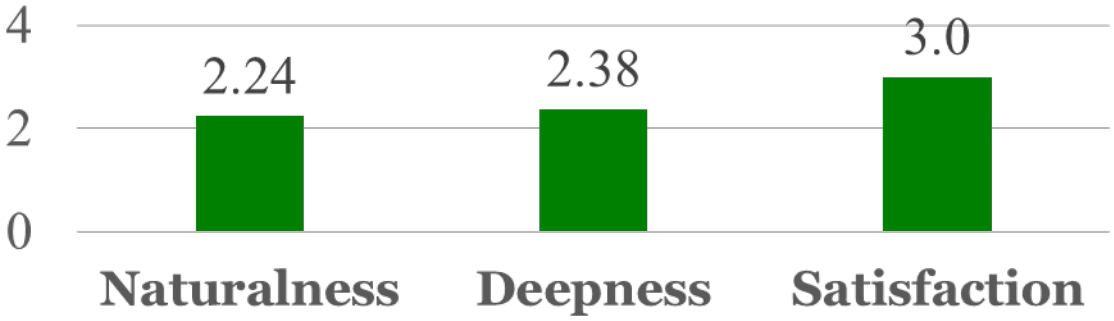
Topics	**Support**	**Oppose**
Casino bill	38	68
Capital punishment	158	183
Nuclear power plant reoperation	54	220

Number of subjects : **8 person**

Evaluation metric: **5 point Likert scale (1-5)**

- Naturalness - system response was natural or not
- Deepness - discussion was established or not
- Satisfaction - new knowledge was obtained or not

Experimental result:



Conclusion

- A debate system was proposed to help users to understand news deeply in the question answering system “NetTv”.
- User stance (support/oppose/neutral) and the reason (present /absent) were estimated using CNN and evaluated.
- Debate database was constructed by extracting arguments from Web data for three topics and debate was subjectively evaluated.

Future works

- There are gaps between the system and user response due to the lack of value evaluation between them.
- The debate database must have many high quality arguments and they have to be converted from writing style to speaking style with unification of the characters as well as styles.

Thank you!